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PENSOFT

New distributional and biological data for three species of *Stenodynerus* (Hymenoptera, Vespidae, Eumeninae) from Panama

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Abstract

We provide new data on the distribution and biology of the three *Stenodynerus* species (Hymenoptera, Vespidae, Eumeninae) from Panama: *Stenodynerus iolans* (Cameron, 1905) is recorded for the first time from Panama; several localities are added to the known distribution in Panama of *S. farias* (Saussure, 1857); and *S. otomitus* (Saussure, 1857), currently known as a ground-nester, was found emerging from exposed cells together with *Ipsiura pilifrons* (Cameron, 1888) (Hymenoptera, Chrysididae).

Keywords

Central America, distribution, mud nests, natural enemy

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Introduction

Knowledge on the nesting biology of eumenine vespid wasps (Hymenoptera, Vespidae, Eumeninae) is quite scarce and highly fragmented. An overview of eumenine nesting biology recognized three general categories: excavators, renters, and builders (Iwata 1976). The application of this system for differentiating species, genera, and tribes has been challenged by the polymorphic behavioral plasticity of some genera, such as *Hypodynerus* de Saussure, 1855, of which species can be either builders or renters (Joseph 1924, 1930), *Ancistroceroides* de Saussure, 1855, which can be either renters or excavators (Joseph 1924, 1930; Evans and Matthews 1974), *Pachodynerus* de Saussure, 1870, which practice all three categories (Willink and Roig-Alsina 1998), or *Minixi* Soika, 1978 (Hermes et al. 2015), which are normally builders (common in other Eumenini) but which occasionally behaves as a renter.

These nesting categories are not a fixed and reliable set of characters, but just a recipe of basic, and at least sometimes, interchangeable behaviors. The reality is indeed more complex, as renters, for example, pursue different strategies to take advantage of the ecological

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niches available: some of them just close the entrance of abandoned nests by other aculeates, others build consecutive partitions inside tunnels, and yet others build entire cells inside their rented cavity (Iwata 1976). Ecological factors such as resources availability, on the other hand, may be important for both intraspecific nesting plasticity and protection strategies against potential enemies (Hermes et al. 2015).

Stenodynerus de Saussure, 1864 (Hymenoptera, Vespidae, Eumeninae) is a large genus with 161 species worldwide, distributed in the Nearctic, Neotropical, Palearctic, and Oriental regions (Ma et al. 2016). Thirty-eight species have been recorded from Mexico to Argentina and Chile, but many more still await to be described (Carpenter and Garcete-Barrett 2002). Five species of *Stenodynerus* have been recorded from Panama to date: *S. farias* (Saussure, 1857), *S. licinus* Bohart, 1980, *S. mimulus* (Zavattari, 1912), *S. sonoitensis* Bohart, 1949 (Bohart 1980), and *S. otomitus* Saussure, 1857. *Stenodynerus* species are rather small potter wasps which nest as renters, either in fissures on trunks, stems, and walls, or in abandoned mud cells of other aculeates (Markin and Gittins 1967).

Among the natural enemies of solitary wasps, *Ipsiura* Linsenmaier, 1959 is one of the most species-rich groups of Chrysididae in the Neotropical region. These wasps are seldom encountered in field studies, but they can be abundant in trap-nesting studies. Their biology is poorly known, being limited to just a few host records. Wasps in the genera *Trypoxylon* Latreille, 1796 (Crabronidae), *Sceliphron* Klug, 1801 (Sphecidae), *Eumenes* Latreille, 1802, and *Pachodynerus* de Saussure, 1870 (Vespidae, Eumeninae) are currently the only known hosts for the genus (Bohart 1985; Linsenmaier 1985; Kimsey and Bohart 1991). *Ipsiura pilifrons* (Cameron, 1888) is entirely lacking in natural history data (Lucena 2016).

Our aim is to report *Stenodynerus iolans* (Cameron, 1905) for the first time from Panama, to add data to the know distribution in Panama of *S. farias*, and to address interesting facts about the nesting biology of *S. otomitus* Saussure, 1857, including being parasitized by *I. pilifrons*.

Methods

Fieldwork was undertaken in the Panamanian localities of Ave María, Los Santos Province (07.3222°N, 080.4507°W), and El Guabal, Veraguas Province (07.9240°N, 081.2917°W) (Fig. 3). In each locality, the two of us (JAL and ASM) walked along a linear transect of approximately 1 km, on rough tracks above rocky formations, checking for the presence of wasps nests at the bases of trees, on branches, and on the undersides of leaves in trees and shrubs up to 1.5 m above ground level. It was possible to detect and collect several active cells of potter wasp nests. The entire nests were then placed in an emergence cage in the laboratory, maintained at an average temperature of 26 °C and a relative humidity of 82% for the larvae to continue their development. Resultant specimens were examined under a Leica Wild MZ microscope and photographed with a Canon EOS Rebel T7i camera with Canon Macro FC 50 mm lens and Minolta MD Lens Adapter. Focus-stacking was done with Helicon Focus v. 6.7.11 Pro.

Eumenines were identified to genus using the keys by Carpenter and Garcete-Barrett (2002) and to species following Bohart (1980). Their known distribution is based on records given by Bohart (1980) and West-Eberhard et al. (1995). Chrysidoids were determined to genus following Kimsey and Bohart (1991) and to species using the revision by Lucena et al. (2016). Their known distribution is based on data given in these publications. The species diagnoses follow Bohart (1980) for the eumenines and Bohart (1985) for the chrysidid. Maps were created using SimpleMappr (Shorthouse 2010). Specimens are deposited in the Museo de Invertebrados G.B. Fairchild de la Universidad de Panamá (MIUP). The following abbreviations were used in the diagnoses: MOD = midocellus diameter; F = flagellomeres (F-I, F-II, etc.); T = tergum.

Results

***Stenodynerus iolans* (Cameron, 1905)**
Figure 1A

New record. PANAMA – **Veraguas** • Guabal; 07°55′ 26.4″N, 081°17′30.2″W; 29.XI–XI.1998; I. Quezada leg.; manual net; 1 ♀ (MIUP-001-EU-2022).

Identification. *Stenodynerus iolans* differs from other species with a median interocellar tubercle in having very sparse and relatively coarse macropunctation on the clypeus. It further differs from *S. licinus* in having the tegula mostly dark, the flagellum extensively orange within, and the apex of T-II less than 1 MOD thick (Bohart 1980).

Distribution. Mexico, Belize, Guatemala, El Salvador, Honduras, Costa Rica, Panama (Veraguas, Santa Fe) and Colombia. New record for Panama (Fig. 3A).

***Stenodynerus otomitus* (Saussure, 1857)**
Figure 1B

New records. PANAMA – **Veraguas** • Santa Fe, Casa Maquina; 08°29′44.1″N, 081°05′22.8″W; 08.VIII.1987; R. Rodríguez leg.; manual net,; 1 ♀ – **Coclé** • Penonome, Chiguiri Arriba; 20.IV.1994; R. Cambra & A. Rodríguez leg.; manual net; 1 ♀ • Coclé, Antón; 26–27.XII.1992; R. Rodríguez leg., 1 ♀ – **Los Santos** • Guanico Abajo, Ave María; 7°19’34.0”N 80°27’09.1”W, 24.IV.2021; A. Santos-Murgas; nest collected; 7 ♀ (MIUP-003-EU-2022).

Identification. This species differs from others in the *otomitus* group (species with dentate male midfemur, slender parategula, no cross carina on T-II, maculate hind pronotal margin, no free spot-on T-II and male F-XI black) by the mostly reddish wings and tegula, rather coarsely punctate T-I towards its summit, male flagellum

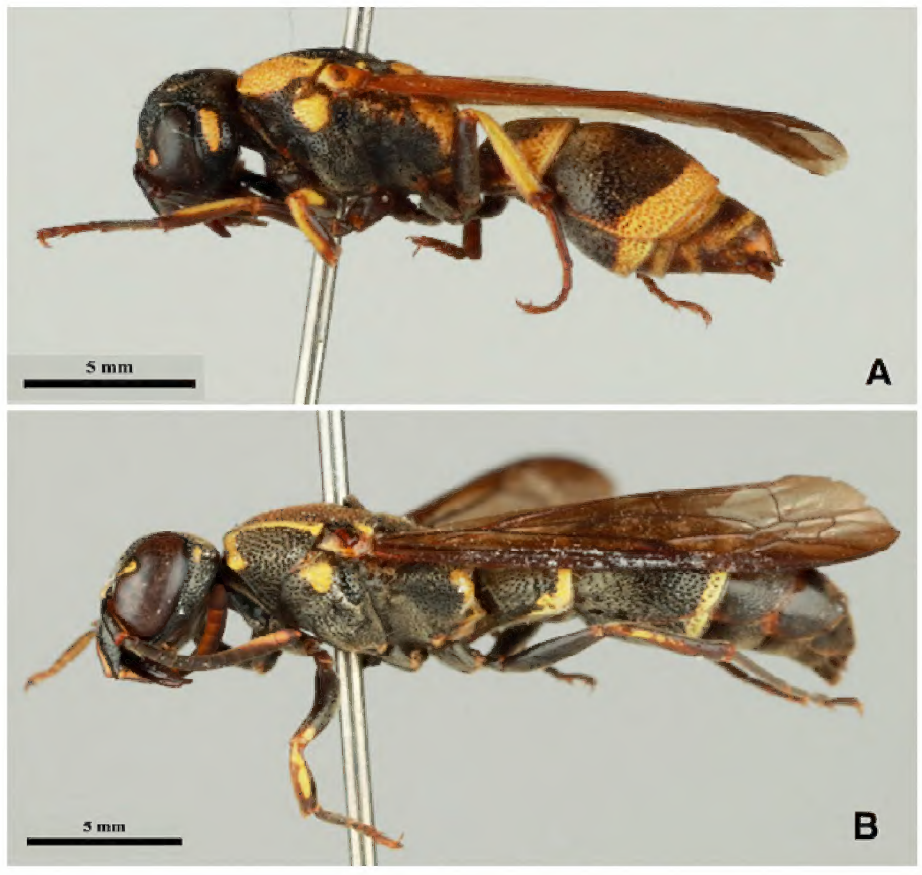

Figure. 1. *Stenodynerus* species in Panama. **A.** *S. iolans* (Cameron, 1905), female, habitus in lateral view. **B.** *S. otomitus* (Saussure, 1857), female, habitus in lateral view.

largely pale within, with F-XI rounded inside view and male femora not especially hairy.

Distribution. Mexico, Guatemala, Honduras, Nicaragua, Costa Rica, Panama (Veraguas, Santa Fe; Cocle, Penonome, Antón) and Colombia. Veraguas is a new provincial record in Panama (Fig. 3A).

Stenodynerus farias (Saussure, 1857)

New records. PANAMA – **Panamá Oeste** • La Chorrera Rio Perequete; 08°47′51.1′N, 079°52′25.2″W; 13.II.1991; R. Cambra leg.; 2 ♂ • same locality; 26–27.II.1991; A. Mena leg.; 1 ♀ • Llano Largo; 08°50′32.3″N, 079°48′09.3″W • same locality; 17.II.1990; A. Niena leg., 1 ♀ – **Colón** • Rio Cuango; 09°30′04.4″N, 079°18′31.6″W; 08.II.1996; A. Rodríguez leg.; 1 ♀ • same locality; 03.II.1996; A. Rodríguez leg.; manual net; 1 ♂ – **Panamá** • Pedregal, Villa Lobos; 09°04′34.3″N, 079°26′27.8″W; 25.III.1991; A. Fernández leg.; 1 ♀ – **Coclé** • Antón, El Valle; 08°37′08.5″N, 080°07′35.6″W; 20.III.1987; R. Rodríguez leg.; manual net; 1 ♂ • same locality; 09.I.1991; J. Coronado leg.; 1 ♀ – **Los Santos** • Cerro Canajagua; 08°38′59.9″N, 080°25′00.8″W; 16.II–09.III.2005; P. González leg.; malaise trap; 1 ♂ – **Veraguas** • Santa Fe, Cerro Tute; 08°32′06.1″N, 081°06′00.0″W; 26.III.1999; A. Santos & L. De Gracia leg.; manual net; 1 ♂ (MIUP-002-EU-2022).

Identification. This species differs from others in having a median interocellar tubercle and by the combination of a finely punctate clypeus and TII with a posterior thickness of <1 MOD (Bohart 1980).

Distribution. Mexico, El Salvador, Costa Rica, and Panama (Panamá Oeste, Colón, Panamá, Los Santos, Veraguas, and Coclé). The Panamanian records from Colón, Panamá, Los Santos, Veraguas, and Coclé are new provincial records (Fig. 3B).

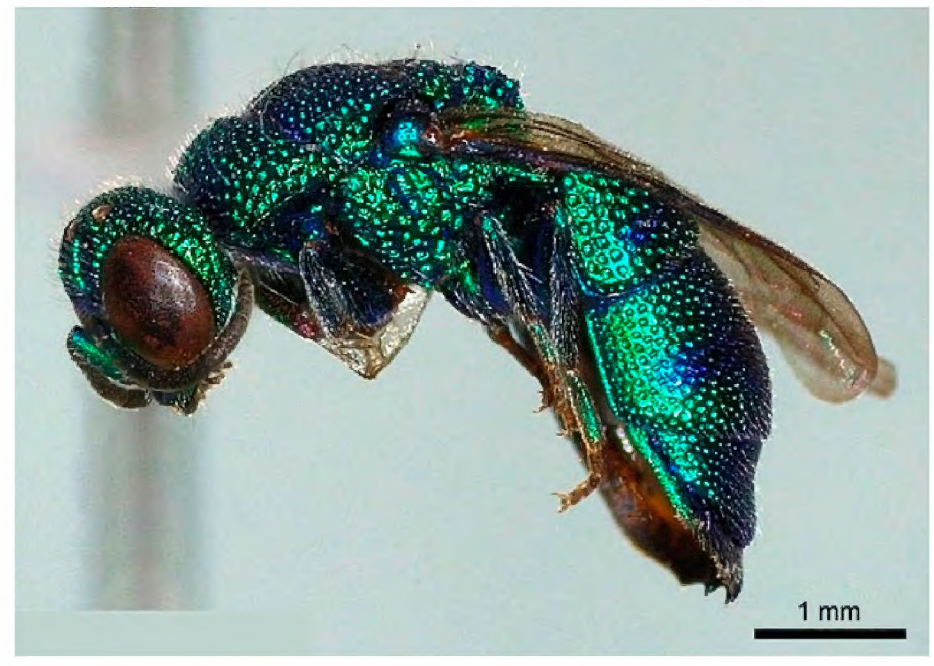

Figure 2. *Ipsiura pilifrons* (Cameron, 1888), parasitoid emerged from nest of *Stenodynerus otomitus* (Saussure, 1857).

Biology nesting and parasitism (Fig. 4). Seven nests were collected on 24.IV.2021 at Ave María (Los Santos). Each nest consisted of one to eight cells, for a total of 24 cells. The entire nest was composed of an unknown, hard and rough plant material. The cells were basally oval and in the apical region with an abrupt straight cut where the exit hole, sealed with mud, was located. The length of the cells varied from 14.03 to 15.02 mm and the diameter at the middle was 10.15 mm. The different building materials using in the cell walls and their seals would indicate the reusage of nests of other aculeates. Seven individuals of *Stenodynerus otomitus* were obtained from those nests, as well as one *Ipsiura pilifrons*.

Ipsiura pilifrons (Cameron, 1888)

Figure 2

New record. PANAMA – **Los Santos** • Guanico Abajo, Ave María; 07°19′34.0″N, 080°27′09.1″W, 24.IV.2021; A. Santos-Murgas; nest collected; 1 ♀ (MIUP-001-CHR-2022).

Identification. *Ipsiura pilifrons* is distinguished from other *Ipsiura* species in having the T-III with a row of six very sharp teeth, but with neither whitish spots on its lateral region nor a distinct prepit roll, and in having the pit row followed by a series of weak depressions. The midocellar area is open, and the dark spots on S-II are ovoid and near each other.

Distribution. Mexico from Brazil (Kimsey and Bohart 1991), Colombia, Costa Rica, Panama, Nicaragua, Surinam, Venezuela, Mexico (Lucena et al. 2016).

Discussion

In his revision of Central American *Stenodynerus* species, Bohart (1980) mentioned the presence of four species in Panama: *S. licinus*, *S. otomitus*, *S. sonoitensis*, and *S. farias*. At the same time, he gaves the distribution of *S. iolans* from Mexico, Belize, Guatemala, El Salvador, Honduras, Costa Rica, and Colombia, but without records from Panama (Bohart 1980). The presence of *S. iolans* in this country is confirmed here.

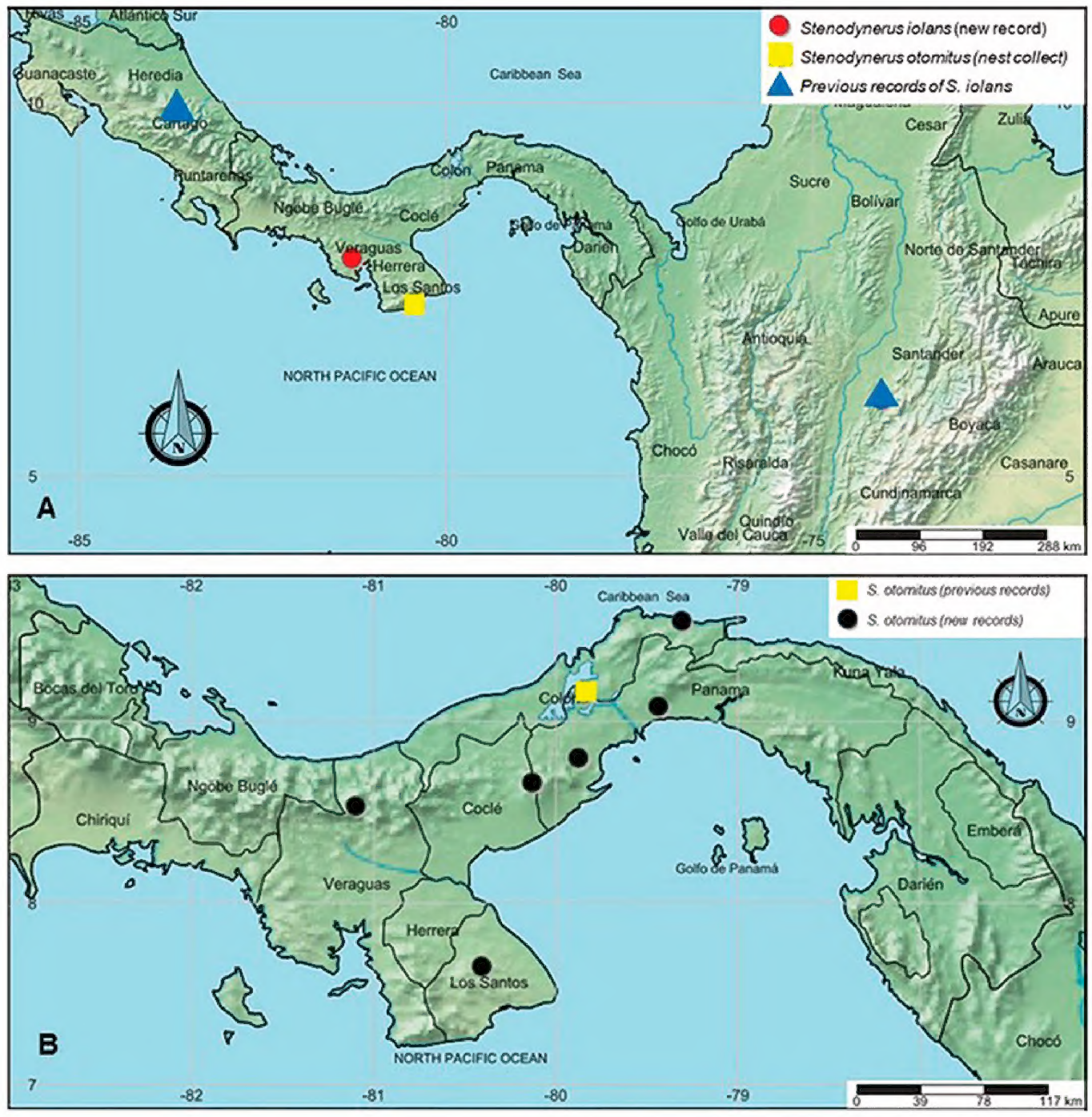

Figure 3. Distribution of *Stenodynerus* in Panama. **A.** *S. iolans* (Cameron, 1905) and nest site of *S. otomitus* (Saussure, 1857). **B.** *S. farias* (Saussure, 1857) showing expanded distribution.

Many species of *Stenodynerus* use pre-existing cavities (Krombein 1967) or dig their own nests in the soil (Evans 1956) and do not build exposed nests or reuse exposed nests built by other aculeates. Until now, *S. otomitus* was only known to build underground nests (Evans and Matthews 1974; Sarmiento et al. 2002), so our observation of this species apparently reusing cells seems atypical and suggests an interesting behavioral plasticity for this species. Moreover, the emergence of *Ipsiura pilifrons* from these nests constitutes the first report of nest parasites for *S. otomitus*.

Figure 4. *Stenodynerus otomitus* (Saussure, 1857) nests where *Ipsiura pilifrons* (Cameron, 1888) emerged.

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Authors' Contributions

Conceptualization: JAL, AS. Data curation: JAL, BRGB. Investigation: JAL. Methodology: JAL, AS. Supervision: AS, BRGB. Visualization: JAL, BRGB. Writing – original draft: JAL. Writing – original draft: JAL. Writing – review and editing: JAL, BRGB, AS.

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